POLISHING METHOD FOR SEMICONDUCTOR

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Abstract

PURPOSE:To prevent passage of a polishing ending ground point, to shorten a polishing time and to eliminate an optical microscope and a measuring instrument by monitoring a surface of a semiconductor substrate from below a rotary polishing plate by utilizing a transparent part to be formed by rotating a transparent part of the plate.
CONSTITUTION:A semiconductor substrate is fixed to an end face of a jig 14 slightly protruding from a bottom at the side of an oblique side face of the jig 14 on a fixed rotary polishing plate 15. Then, a wedge-shaped groove formed on an opposed side face and a threaded part of a saw of a jig fixing rod 4 are placed while engaging the groove with the threaded part. The plate 15 is rotated by a rotary motor 12. A camera 13 monitors a surface of the substrate inclined obliquely from below the plate by utilizing a transparent part formed by rotating a glass part 16 of the plate 15. An arrival of the side face of the substrate at coordinates of a preset polishing position control line is recognized, and the motor is automatically stopped.

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Title of the Invention

SEMICONDUCTOR POLISHING METHOD

Scope of Patent Claims

(1) A semiconductor polishing method for polishing a side surface of a semiconductor substrate in the shape of a small piece by a predetermined amount as being pressed against a rotary polishing plate mounted on a shaft of a motor, characterized by automatically terminating a drive of said motor upon polishing of said predetermined amount which has been set previously.

(2) The semiconductor polishing method of claim 1, characterized in that regarding a plate surface of said semiconductor substrate, said side surface is pressed opposed to said rotary polishing plate obliquely and said rotary polishing plate includes a transparent portion at least a portion thereof, wherein a plate surface shape of said semiconductor substrate is monitored from below said rotary polishing plate.

Detailed Description of the Invention

[0001]
[Field of Industrial Applications]
The present invention relates to a semiconductor polishing apparatus for polishing a side surface of a semiconductor substrate in the shape of a small piece after dicing of a semiconductor wafer.

[0002]
[Prior Art]

Fig. 5 is a perspective view of a conventional semiconductor polishing apparatus and Fig. 6 is a cross sectional view along line B-B' in Fig. 5. Conventionally, a semiconductor polishing apparatus 1 of Fig. 5 includes a cylindrical water receiving tray 2, a water poring tap 2 and a jig fixture rod 4 in the upper portion of the main body, and it includes in its interior a drive controller 11 and a rotating motor 12 as shown in Fig. 6 with a shaft 3 of rotating motor 12 projecting at the center of the cylindrical wafer receiving tray 10. A front surface portion is comprised of a display portion 5, a drive control button 6, a number of rotation control button 8 and a water poring control button 9. The cylindrical water receiving tray 10 is inclined to discharge water to the exterior. The jig fixture rod 4 is a rectangular parallelepiped extending from a portion of the main body and its side surface is formed with a saw ridge. The display portion 5 is a liquid crystal display which displays the number of rotations, while the number of rotations is varied by the number of rotation control button 8 and the number of rotations is supplied to the drive controller 11. The drive of rotating motor 12 is controlled by the drive control button 6, thereby having the shaft 3 rotated. The water poring tap 2 is closed or opened by the water poring control button 9 and the water is pored in the vicinity of the jig fixture rod 4 during polishing.

[0003]

Fig. 7 is a perspective view of a jig for fixing a semiconductor material, and use is made of a metallic material which can be heated and is large in weight. Its shape is a rectangular parallelepiped and a wedge shaped groove is formed at the central portion of one side surface. A rotary polishing plate 15 of Fig. 8 is disc-shaped and file teeth exist across the entire surface. The file teeth range from coarse teeth to fine teeth. Besides, there is a glass-like polishing plate formed of quartz or the like. The semiconductor polishing plate 15 is fixed at the shaft 3 of rotating motor 12, which projects at the center of the cylindrical water receiving tray 10, with its surface provided with file teeth facing upward.

[0004]

After having the plate surface of the semiconductor substrate fixed at an end surface of jig 14 as protruding slightly below from the bottom surface of jig 14, it is placed on the rotary polishing plate 15 which has been fixed

with the wedge-shaped groove in the side surface of jig 14 mating with the saw ridge portion of jig fixture rod 14. With the rotary polishing plate 15 in rotation by the rotating motor 12, the semiconductor substrate side surface and the rotary polishing plate are brought into contact utilizing the weight of jig 14, thereby causing polishing to take place.

[0005]

[Problems to be solved by the Invention]

However, in a semiconductor polishing apparatus as described above, it was necessary to measure a unit amount of polishing in advance depending on the number of rotations of the polishing plate and each kind of file teeth. That is, at first, polishing was carried out at an arbitrary number of rotations and time, and then the polished distance was measured by observing the semiconductor substrate plate surface by an optical microscope or the like. It was necessary to calculate the time to reach a polish end point from the distance and the number of rotations. There was a case in which the calculation erred and the polish point was exceeded. On the other hand, in order to avoid this, the polishing time was divided into fine segments and polishing was carried out while confirming the polish point of the semiconductor substrate each time by an optical microscope or the like, so that an exorbitant amount of time was expended.

[0006]

Under the circumstances, the present invention has an objective of prevention of passing a polish end point, non-necessity of an optical microscope or a meter, and a reduction of polishing time.

[0007]

[Means for solving the problems]

In order to solve the above-mentioned problems, in accordance with the present invention, a jig, to which a semiconductor material is obliquely (such that a semiconductor substrate plate surface faces a rotary polishing plate) fixed, is placed on a rotary polishing plate, in which file teeth and a transparent portion both exist, and the semiconductor substrate plate surface is monitored from below the rotary polishing plate utilizing a transparent area created by the rotation of the transparent portion of the rotary polishing plate.

[0008]

[Function]

In a semiconductor polishing apparatus structured as described above, the coordinates and presence of a

semiconductor substrate can be recognized by subjecting an image of a monitored semiconductor substrate plate surface to image processing, so that the drive of the motor can be terminated automatically when the semiconductor substrate side surface has reached the coordinates of the polish end point which have been set in advance.

[0009]

[Embodiment]

Fig. 1 shows a perspective view of a semiconductor polishing apparatus according to the present invention and Fig. 2 shows a cross sectional view along line A-A' in Fig. 1. The semiconductor polishing apparatus 1 of Fig. 1 includes a cylindrical water receiving tray 10, a water poring tap 2 and a jig fixture rod 4 in the upper portion of the main body and it includes, in its interior, a drive controller 11, a rotating motor 12 and a camera 13 as shown in Fig. 2 with a shaft 3 of rotating motor 2 projecting at the center of cylindrical water receiving tray 10 and its front surface portion comprised of a display portion 5, a drive control button 6, a polish position control button 7, a number of rotation control button 8 and a water discharge control button 9 as shown in Fig. 1. The cylindrical water receiving tray 10 is so inclined to cause water to be discharged to the exterior. The jig fixture rod 4 is a rectangular parallelepiped extending from a portion of the main body with a saw ridge formed in its side surface. The display portion 5 displays an image captured by the camera and at the same time displays the number of rotations and a polish position control line or the like. The polish position control line is varied by the polish position control button 8 and the number of rotations is varied by the number of rotation control button 8. An image of the semiconductor substrate plate surface which is being monitored by the camera 13 is fed to the drive controller 11 to be subjected to image processing, thereby recognizing the coordinates and the existence of a semiconductor substrate.

[0010]

In addition, the number of rotations and the coordinates of the polish position control line are delivered to the drive controller 11. The drive of rotating motor 12 is controlled by the drive control button 6 to have the shaft 3 rotated. The opening and closing of the water poring tap 2 is carried out by the water poring control button 9 and water is pored in the vicinity of the jig fixture rod 4. For the jig 14 for fixing a semiconductor substrate of Fig. 3, use is made of a metallic material which can be heated and which is

large in weight. Its shape is a rectangular parallelepiped and a corner of a side surface, to which a semiconductor material is fixed, is cut at an angle ranging from 40 to 80 degrees relative to the top surface to thereby define a slope and a wedge-shaped groove is formed in the central portion of the opposite side surface.

[0011]

The rotary polishing plate 15 of Fig. 4 is disc-shaped and three glass portions are provided radially outwardly from the center with the rest provided with file teeth. Provision is made of file teeth ranging from coarse teeth to fine teeth, and the glass portions are formed to be transparent using a quartz-like material. The rotary polishing plate 15 is fixed at the shaft 3 of rotating motor 12 which projects at the center of cylindrical water receiving tray 10 with its surface provided with file teeth facing upward.

[0012]

On the rotary polishing plate 15, which has been fixed, after having a semiconductor substrate fixed to an end surface of jig 14 as slightly protruding downward from the bottom surface at the side of a sloped side surface of jig 14, it is placed with the wedge-shaped groove formed in the opposite side surface mating with the saw ridge portion of jig fixture rod 4. The rotary polishing plate 15 is rotated by the rotating motor 12. The camera 13 monitors the semiconductor substrate plate surface which is inclined obliquely from below the rotary polishing plate by utilizing where it is transparent which is formed by the rotation of the glass portions 16 of rotary polishing plate 15. Upon recognition of the side surface of the semiconductor substrate reaching the coordinates of polish position control line which have been set in advance, the drive of the motor is terminated automatically.

[0013]

[Effects of the Invention]

As described above, in accordance with the present invention, it is so structured that a jig, to which a semiconductor substrate is fixed obliquely (such that the semiconductor substrate plate surface faces the rotary polishing plate surface), is placed on the rotary polishing plate having both file teeth and transparent portions in a surface, and the semiconductor substrate plate surface is monitored from below the rotary polishing plate by utilizing a transparent area which is created by the rotation of the transparent portions of the rotary polishing plate, wherein upon reaching of the semiconductor substrate plate surface at

a previously set polish end point, the drive of the motor is automatically terminated, and, therefore, the polish end point can be automatically reached without calculating the polishing time using an optical microscope or meter and the passing of the polish end point can be prevented from occurring. Besides, it leads to a reduction of polishing time and a mitigation of the number of steps.

Brief Description of the Drawings

Fig. 1 is a perspective view of a semiconductor polishing apparatus of the invention.

Fig. 2 is a cross sectional view along line A-A' of the semiconductor polishing apparatus of Fig. 1.

Fig. 3 is a perspective view of a jig for fixing a semiconductor substrate of the invention.

Fig. 4 is a perspective view of a jig showing a rotary polishing plate of the invention.

Fig. 5 is a perspective view showing a conventional semiconductor polishing apparatus.

Fig. 6 is a cross sectional view along line B-B' of the semiconductor polishing apparatus of Fig. 5.

Fig. 7 is a perspective view of a conventional jig for fixing a semiconductor substrate.

Fig. 8 is a perspective view of a conventional rotary polishing plate.

[Explanation of Reference Numerals]

1: Semiconductor Polishing Apparatus
2: Power Poring Tap
3: Rotary Motor Shaft
4: Jig Fixture Rod
5: Display Portion
6: Drive Control Button
7: Polish Position Control Button
8: Number of Rotation Control Button
9: Water Poring Control Button
10: Cylindrical Water Receiving Tray

11: Drive Controller
12: Rotary Motor
13: Camera
14: Jig
16: Rotary Polishing Plate (Transparent Portion)

[Summary]
[Structure] On a rotary polishing plate including both file teeth and transparent portions in a plane mounted on a rotating motor shaft 3, a jig, to which a semiconductor substrate plate surface in the shape of a small piece is fixedly attached obliquely downwardly, is placed mating with a jig fixture rod 4 and in contact with a semiconductor substrate side surface, and the semiconductor substrate plate surface is monitored by a camera 13 from below the rotary polishing plate utilizing a transparent area created by the rotation of the transparent portions of the rotary polishing plate, wherein by subjecting an image of the semiconductor substrate plate surface to image processing, the recognition of the coordinates and the presence of a semiconductor substrate is effected and the drive is automatically terminated upon reaching of the semiconductor substrate side surface at the previously set coordinates of the polish end point.
[Effects] The polish end point can be reached automatically without calculating a polishing time using an optical microscope and a meter, and the passing of the polish end point can be prevented from occurring. Besides, it leads to a reduction of polishing time and a mitigation in the number of steps.

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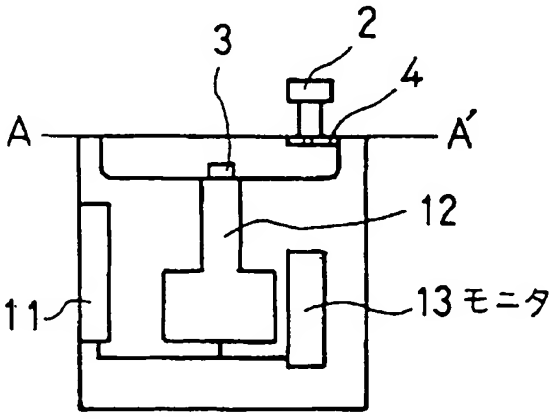
(54)【発明の名称】　半導体研磨方法

(57)【要約】

【構成】　回転モータ軸３に取りつけられた面内にやすり目と透明部が共存する回転研磨板上に、小片状の半導体基板板面を下向きに斜めに固着した治具を治具固定棒４に噛み合わせて半導体基板側面を接触させて置き、回転研磨板の透明部が回転することによってできる透明なところを利用して、回転研磨板下から半導体基板板面をカメラ１３でモニタし、半導体基板板面の映像を画像処理することにより、半導体基板の座標や存在を認識し、予め設定した研磨終了地点の座標に半導体基板側面が到達したときに、自動的に駆動を停止する。

【効果】　光学顕微鏡や計測器を用いて研磨時間を算出することなく、研磨終了地点まで自動的に到達することができ、研磨終了地点通過をも防止できる。また、研磨時間の短縮と工数の軽減につながる。



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【特許請求の範囲】

【請求項１】　小片状の半導体基板の側面をモータの軸に取りつけられた回転研磨板に押さえつけて所定量研磨する半導体研磨方法において、前記半導体基板の板面形状をモニタし、あらかじめ設定した前記所定量を研磨したら前記モータの駆動を自動的に停止させることを特徴とする半導体研磨方法。

【請求項２】　前記半導体基板の板面は前記回転研磨板に斜めに対抗させて前記側面が押さえつけられ、前記回転研磨板は少なくとも一部に透明部を有しており、前記半導体基板の板面形状を前記回転研磨板下からモニタすることを特徴とする請求項１記載の半導体研磨方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、半導体ウェハをダイシングしたあとの小片状の半導体基板の側面研磨する半導体研磨装置に関する。

【０００２】

【従来の技術】図５に従来の半導体研磨装置の斜視図と、図６に図５のＢ－Ｂ’線に沿った断面図を示す。従来、図５の半導体研磨装置１は、本体上部には円柱型水受け皿１０、注水口２、治具固定棒４があり、また内部には図６に示すように駆動制御器１１、回転モータ１２、円柱型水受け皿１０の中心には回転モータ１２の軸３が突起している。前面部には表示部５、駆動制御ボタン６、回転数制御ボタン８、注水制御ボタン９から形成されている。円柱型水受け皿１０は、斜度をつけて水を外部に排出するようになっている。治具固定棒４は本体の一部から伸びた長方体で、側面に鋸山を形成する。表示部５は液晶ディスプレイで回転数を表示、回転数制御ボタン８で回転数を可変させ、回転数を駆動制御器１１へ送る。駆動制御ボタン６で回転モータ１２を駆動制御し、軸３を回転させる。注水制御ボタン９で、注水口２の開閉を行い、水は研磨時治具固定棒４付近に注水される。

【０００３】図７は半導体材料を固定する治具の斜視図で、加熱可能な重みのある金属性材料を使用する。形状は長方体で、一側面の中央部に楔形溝を形成。図８の回転研磨板１５は、円板型で全面にやすり目が存在する。やすり目は、荒い目から細かい目がある。また、石英等で形成されるガラス状の研磨板がある。半導体研磨板１５は、円柱型水受け皿１０中心に突起している回転モータ１２の軸３に、やすり目がある面を上にし固定させる。

【０００４】固定させた回転研磨板１５上に、半導体基板の板面を治具１４の底面より下に少しはみだして治具１４の端面に固定させたのち、治具１４側面の楔形溝と治具固定棒４の鋸山部分とを噛み合わせながら置く。回転研磨板１５を回転モータ１２で回転させ、半導体基板側面と回転研磨板を治具１４の重量を利用して接触させ研磨する。

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【０００５】

【発明が解決しようとする課題】しかしながら、上記のような半導体研磨装置では、研磨板の回転数、やすり目の種類の各々に応じて、あらかじめ単位あたりの研磨量を測定しておく必要があった。すなわち、最初に任意の回転数、時間で研磨し、研磨された距離を光学顕微鏡等で半導体基板板面を観察し測定する。この距離と回転数から研磨終了地点までの時間を算出しておく必要があった。また算出を誤り研磨終了地点を過ぎてしまうことがあった。また、これを防ぐために、研磨時間を小刻みに区切り、その都度半導体基板の研磨地点を光学顕微鏡等で確認して、研磨していたので、かなりの時間を費やしていた。

【０００６】そこでこの発明は、研磨終了地点の通過防止、光学顕微鏡や計測器の不要、研磨時間の短縮を目的とする。

【０００７】

【課題を解決するための手段】上記課題を解決するために、本発明はやすり目と透明部が共存する回転研磨板上に、半導体材料を斜めに（半導体基板板面が回転研磨板に向くよう）固定した治具を置き、回転研磨板の透明部が回転することによってできる透明なところを利用して、回転研磨板下から半導体基板板面をモニタする。

【０００８】

【作用】上記のように構成された半導体研磨装置においては、モニタした半導体基板板面の映像を画像処理することにより、半導体基板の座標や存在を認識でき、予め設定した研磨終了地点の座標に半導体基板側面が到達したときに、自動的にモータの駆動を停止できることとなる。

【０００９】

【実施例】図１に本発明による半導体研磨装置の斜視図を、図２に図１のＡ－Ａ’線に沿った断面図を示す。図１の半導体研磨装置１は、本体上部には円柱型水受け皿１０、注水口２、治具固定棒４、内部には図２に示すように駆動制御器１１、回転モータ１２、カメラ１３、円柱型水受け皿１０中心には回転モータ１２の軸３が突起し、前面部には図１に示すように表示部５、駆動制御ボタン６、研磨位置制御ボタン７、回転数制御ボタン８、排水制御ボタン９から形成されている。円柱型水受け皿１０は、斜度をつけ水を外部に排出するようになっている。治具固定棒４は、本体の一部から伸びた長方体で、側面に鋸山を形成する。表示部５はカメラで撮った映像が映しだされると同時に回転数や研磨位置制御ライン等も表示する。研磨位置制御ボタン７で研磨位置制御ラインを、また回転数制御ボタン８で回転数を可変させる。カメラ１３でモニタした半導体基板板面の映像は、駆動制御器１１に送り画像処理され、半導体基板の座標と存在を認識する。

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【００１０】また、回転数、研磨位置制御ラインの座標は駆動制御器１１へ送られる。駆動制御ボタン６で回転モータ１２を駆動制御し軸３を回転させる。注水制御ボタン９で、注水口２の開閉を行い、水は治具固定棒４付近に注水される。図３の半導体基板を固定する治具１４は、加熱可能な重みのある金属性材料を使用する。形状は長方体で、半導体材料を固定する側面のかどを上面に対し４０～８０度の角度で切断し斜度を形成、対抗する側面の中央部には楔形溝を形成する。

【００１１】図４の回転研磨板１５は、円板型で中心から外側へ放射状に３本ガラス部を設け、他はやすり目を存在させる。やすり目は、荒い目から細かい目のものを揃え、またガラス部は石英状の材質を使用し透明に形成する。回転研磨板１５は、円柱型水受け皿１０中心に突起している回転モータ１２の軸３に、やすり目がある面を上にし固定させる。

【００１２】固定させた回転研磨板１５上に、半導体基板を治具１４の斜度のある側面側に、底面より下に少しはみだして治具１４の端面に固定させたのち、対抗する側面に形成されている楔形溝と治具固定棒４の鋸山部分とを噛み合わせながら置く。回転研磨板１５を、回転モータ１２で回転させる。カメラ１３は、回転研磨板１５のガラス部１６が回転することにより形成される透明なところを利用して、回転研磨板下から斜めに傾けられた半導体基板板面をモニタする。あらかじめ設定した研磨位置制御ラインの座標に半導体基板の側面が達したことを認識して、自動的にモータの駆動を停止させる。

【００１３】

【発明の効果】この発明は、以上説明したように、面内にやすり目と透明部が共存する回転研磨板上に、半導体基板を斜めに（半導体基板板面が回転研磨板面に向くよう）固定した治具を置き、回転研磨板の透明部が回転することによってできる透明なところを利用して、回転研磨板下から半導体基板板面をモニタし、予め設定した研磨終了地点に半導体基板板面が到達したときに、自動的

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にモータの駆動を止めるという構成としたので、光学顕微鏡や計測器を用いて研磨時間を算出することなく、研磨終了地点まで自動的に到達することができ、研磨終了地点通過をも防止できる。また、研磨時間の短縮と工数の軽減につながる。

【図面の簡単な説明】

【図１】本発明の半導体研磨装置の斜視図である。

【図２】図１の半導体研磨装置のＡ－Ａ’線に沿った断面図である。

【図３】本発明の半導体基板を固定する治具の斜視図である。

【図４】本発明の回転研磨板を示した治具の斜視図である。

【図５】従来の半導体研磨装置を示した斜視図である。

【図６】図５の半導体研磨装置のＢ－Ｂ’線に沿った断面図である。

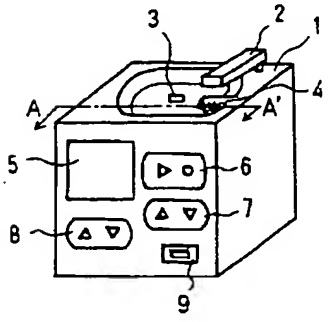
【図７】従来の半導体基板を固定する治具の斜視図である。

【図８】従来の回転研磨板を示した斜視図である。

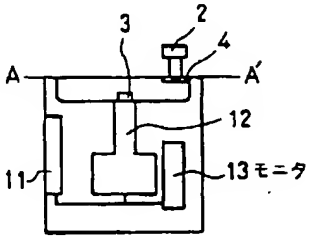
【符号の説明】

１　半導体研磨装置
２　注水口
３　回転モータ軸
４　治具固定棒
５　表示部
６　駆動制御ボタン
７　研磨位置制御ボタン
８　回転数制御ボタン
９　注水制御ボタン
１０　円柱型水受け皿
１１　駆動制御器
１２　回転モータ
１３　カメラ
１４　治具
１６　回転研磨板（透明部）

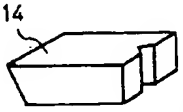
【図１】



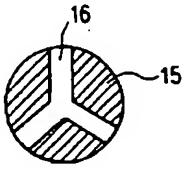
【図２】



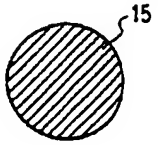
【図３】



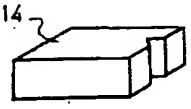
【図４】



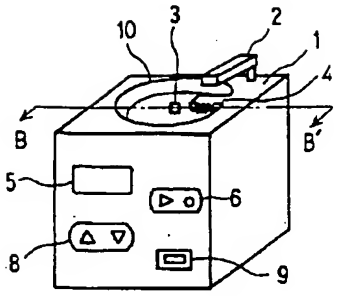
【図８】



【図７】



【図5】



【図6】